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T. Yatabe

DETERMINATION OF SULFUR DIOXIDE IN AIR BY FLAME PHOTOMETRIC DETECTOR METHOD

[Enkokudo keneshutsuho (FPD ho) ni yoru taikuhu no SO_2 sokutei ni tsuite]

Taiki Osen Kenkyu [Air Pollution Research], 9(2):191, Nov 1974.

Presented at the 15th National Air Pollution Research Conference, Nov 6-8, 1974, Chiba.

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DETERMINATION OF SULFUR DIOXIDE IN AIR BY FLAME PHOTOMETRIC DETECTOR METHOD

1. Foreword

In an effort to control air pollution caused by sulfur dioxide, the government has announced a new environmental standard of 0.04 ppm per 24 hours, a value three to four times stricter than the current standard. The introduction of an environmental capacity is a recent innovation, so the measurement of low concentrations of SO_2, as well as of environmental concentrations, is highly important.

Electrolytic conductivity often is used at the present time to measure the SO_2 in the air. This method was in use even prior to the establishment of the environmental standard for sulfur dioxide. The actual use record indicates almost 100% use by the national network, as well as by various stations under autonomous regional organizations.

The error factor in the electrolytic conductivity method, as already reported to this conference [1], is greatly affected by a positive offset based on the evaporation loss of the absorbed liquid when pollutants are other than SO_2. However, the establishment of a logical air pollution prevention measure makes it desirable to design a reliable automatic measuring instrument with SO_2 selectivity. This report concerns a flame photometric detector (FPD) method with SO_2 selectivity. Listed below are the results of a comparison made between performance tests using standard gas, and the rosaniline method used in the field tests.

II. Sample Automatic Measuring Instruments

Type	Manufacturer	Measuring range (ppm)	Quantity of gas collected	Hydrogen consumpt.	Attachments
SA-185	Meloy (electro-chemical instruments)	0~0.2, 0.5, 1.0	0.2 l/min	0.1¼ l/min	Hydrogen generator, standard SO_2 gas generator, mean value computer, linearlyzer, automatic ignition apparat.
APSA-500	Horiba Seisakusho, Ltd.	0~0.1, 0.3, 1.0	1.0 l/min	0.1 l/min	Linearlyzer, mean value computer
SFM-2A	Shimazu Seisakusho, Ltd.	0 ~ 0.1	0.07 l/min	0 l/min	Standard SO_2 gas generator, linearlyzer, mean value computer
8300	Bendix (Kimoto Electronics)	0~0.25, 0.5, 1.0	0.2 l/min	0.9 l/min	Linearlyzer

III. Performance Test Results (selected parts only)

Item / Type	Reproducibility		Stability		Responsivity*					
	Coeff. of variation (%)		Zero point	Span drift	Rise time			Fall time		
	Zero point	Span point	0.0/24 h against F.S.	0.0/15 h against F.S.	T_{50}	T_{90}	T_{95}	T_{50}	T_{90}	T_{95}
A	0	1.5	0	1.5	10 s	4min	7min	5 s	30s	1min
B	0	1.3	0.5	2.5	1 s	30s	1min	-	15s	30s
C	0	2.7	0	0.3	10 s	4min	14min	20s	2min	5min
D	0	4.0	0	3.0	3 s	30s	2min	-	-	30s

*Denotes the reference value because the accumulated time used varied for responsivity.

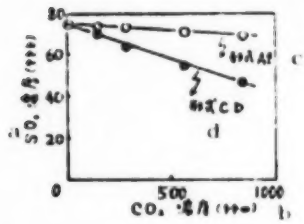

Figure 1. Effect of CO_2.

Key: a - concentration of SO_2 (ppb); b - concentration of CO_2 (ppm); c - type AB; d - type CD.

IV. Field Test Results

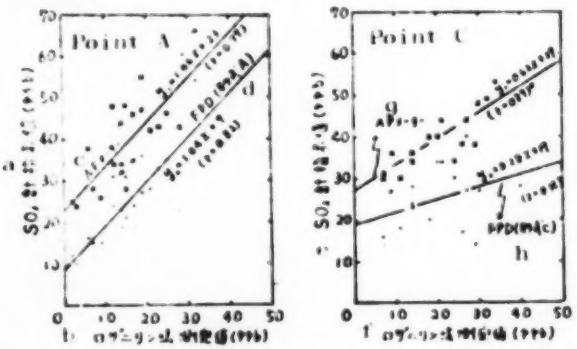

Figure 2. Comparison with rosaniline method.

Key: a - value indicated by SO_2 meter (ppb); b - measured value by rosaniline method (ppb); c - AP meter; d - FPD (type A); e - value indicated by SO_2 meter (ppb); f - value measured by rosaniline method; g - AP meter; h - FPD (type C).

V. Summary

It is believed that the measurement of SO_2 by the FPD method can be used in practical applications. However, the following must be taken into consideration when actually making measurements.

1. The low concentration standard SO_2 gas (permeation tube method, dilution mix method) must be checked by the rosaniline method prior to use.

2. Avoid adsorption of SO_2 by the heating tube, even when using teflon tubes.

3. The linearlyzer, mean value computer, automatic hydrogen gas shut-off apparatus required for extinguishing the flame, automatic ignition apparatus, etc., are believed to be necessary attachments.

VI. Reference

1. Yatabe et al. Draft presented at the 11th National Air Pollution Research Conference (40 p.).